

Improving the effectiveness of UK crop genetic science for wheat and oilseed rape through novel, integrated networks of research

**Kim Hammond-Kosack
Andy Phillips
Neal Evans**

Rothamsted Research

15th March 2006

The Defra Crop Genetic Improvement Networks

Announced July 2002

Dr Donal Murphy-Bokern

**Arable Crop Sciences & Pesticide
Safety Unit**

Science Directorate

Defra



Overall Objectives

- **Each Crop Genetic Improvement Network =**
Virtual Plant Breeding Institute
- **To use crop breeding for the sustainable development of the arable sector**
- **To connect public sector science to the private sector**

Why this need ?

A brief history of UK public and private sector activities in crop genetics

**1960s – Plant Breeders Rights established
- competition till mid-1980s**

Transfer of information only, not breeding material

**1960s-1970s excellent public sector activity in
crop genetics and breeding – PBI, Cambridge**

In mid-1980s, privatisation – sale of PBI and NSDO

**Public Research Institute's to generate revenue
from non-government sources and from own IP**

Where was Defra coming from?

- **Public research - £43 m pa**
 - > £16 m on named crop species
 - > £5 m on targeted research
 - > Little use of LINK
 - > Project based
 - > Pre-competitive
- **Public R&D is only effective in supporting Defra if it results in better varieties**

The Defra Crop Genetic Improvement Networks

To recreate the best of the past

To deploy **existing research resources** in networks of projects that bring public resources together to bear on the **improvement of key crops**

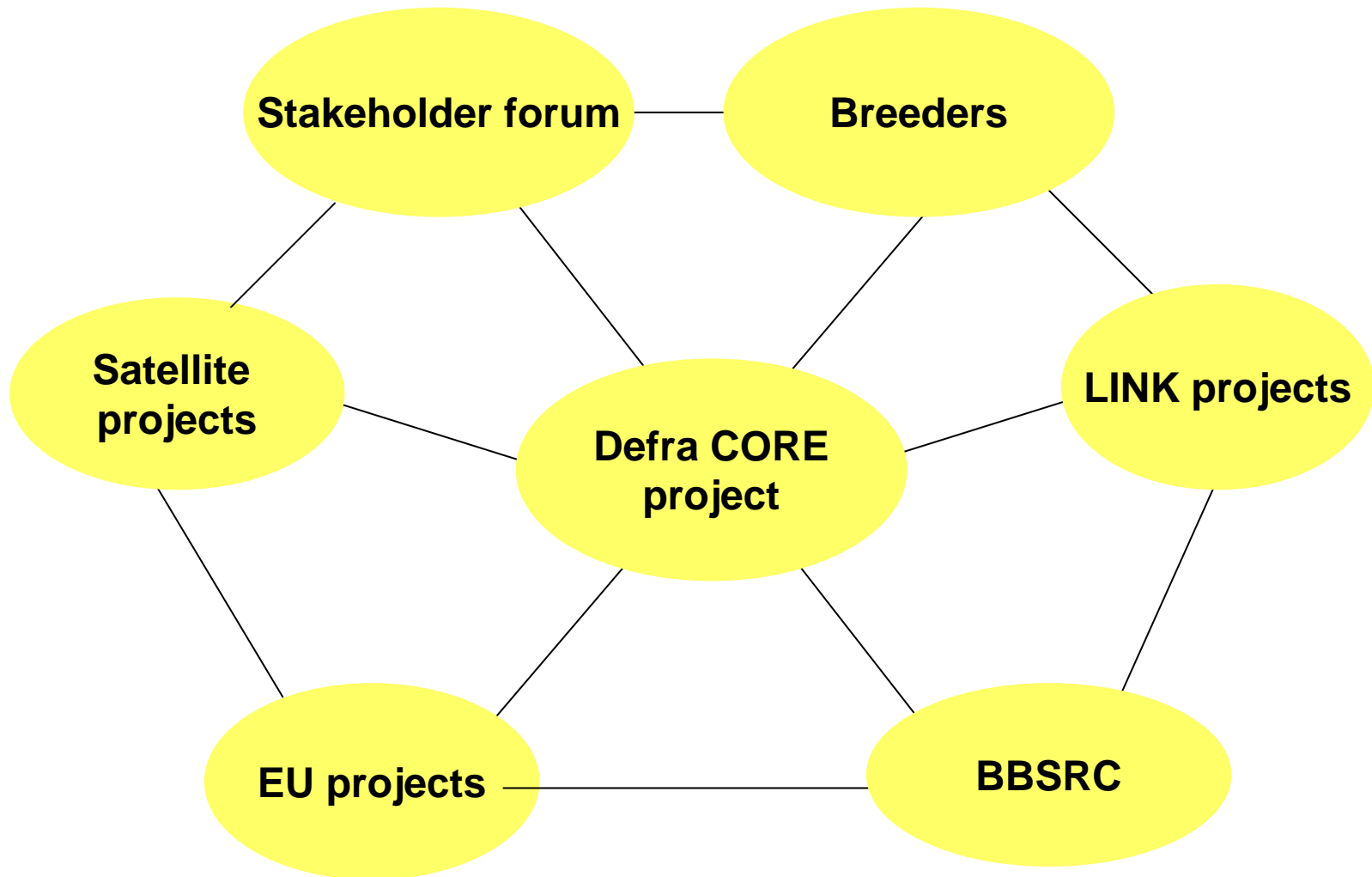
→ Strategic alliances between the public research base and the breeding industry

Networks established

- **Wheat**
- **Oilseed rape**
- **Short rotation coppice**



'GIN network structure



The longer-term vision

- A strong crop breeding sector deploying the best technologies science can offer
- A strong strategic and applied research base competing effectively for resources
- A strong base for international partnerships
- More resource efficient and productive crops

The Defra WGIN Core Project

Aims:

To Underpin Wheat Improvement by Plant Breeders

Approaches:

- 1. Characterisation and provision of genetic resources**
- 2. Genetic mapping and marker development**
- 3. Trait identification**
- 4. Identification and generation of novel variation in key traits : using non-GM approaches**
- 5. Central storage of grain from field trials**
- 6. Liaison and communication**

Funded research partners:

Rothamsted Research and John Innes Centre

WGIN Traits Meeting

June 10th, 2004 at RRes

Breeders' target traits (in order of priority):

Progress (Feb 2006)

- | | |
|----------------------------------|---|
| Hagberg Falling Number | - LINK project funded £2.2M (2005) |
| Septoria resistance | - LINK project renewed |
| Second wheat syndrome | - LINK concept note accepted (2006) |
| Orange blossom midge | - LINK project running |
| Ergot | - LINK project running |
| Lodging resistance | - Some activity within core project (Rht) |
| Barley Yellow Dwarf Virus | |
| Other insect pests | |
| Nitrogen use efficiency | - Defra target but no breeder support |

OREGIN core project

B. napus genetic resources (WHRI)

WP1 Set of germplasm

WP2 Mapping populations

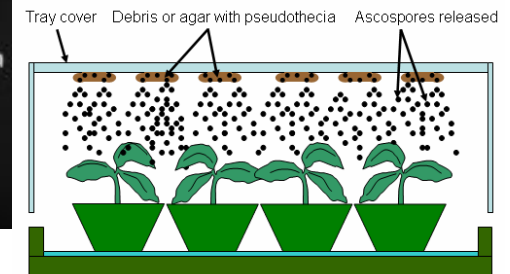
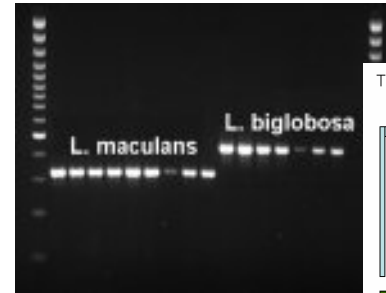
WP3 Genetic variation



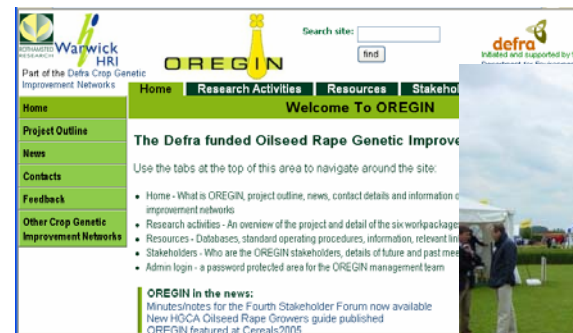
Genetics of disease resistance (RRes)

WP4 Pathogen collection/diversity

WP5 Genetic screening methods



Communication (WP6, WHRI/RRes)



OSR Breeders Target Traits Meeting

November 28th, 2005 at CPB Twyford

Breeders' target traits (in order of priority):

Progress (Feb 2006)

Diseases	-	OREGIN Core project + LINK project on sampling
Insect resistance		
Seedling establishment		
Nitrogen use efficiency	-	LINK project planned
Water utilisation		
Crop architecture	-	LINK project running
Seed quality		
Non-food uses		

WGIN and OREGIN: Resources and Tools

Sources of variation

EMS mutagenised M2 wheat plants

Reference mapping populations

Diploid wheat accessions

Hexaploid wheat genotype collections

Brassica napus Diversity Fixed Foundation Set

Brassica mapping populations

Brassica napus NILs

Evaluation platforms

Molecular markers (SSR)

TILLING – mining for allele variants

Developing efficient screens/”ascospore shower”

L. maculans minisatellites

L. maculans NILs

The Management Teams

WGIN

Defra

Funded partners.

Rothamsted Research

John Innes Centre

Other Partners *

ADAS

University of Nottingham

NIAB

University of Bristol

BBSRC*

UK Wheat breeders*

HGCA*

(*Ex-Officio Members)

OREGIN

Defra

Funded partners.

Rothamsted Research

Warwick HRI

Other Partners *

JIC

ADAS

NIAB

BBSRC*

UK OSR breeders*

HGCA*

(*Ex-Officio Members)

The Stakeholders

WGIN

Millers and Bakers
Brewers and Distillers
CCFRA
Livestock Feed Producers
Food processors
Agrochemical/
Biotech Companies
Wheat Researchers
Field Trials Contractors
Wheat Breeders

OREGIN

Crushers
Livestock Feed Producers
Food processors
Biodiesel producers
Agrochemical/
Biotech Companies
Sponsors (Defra, BBSRC,
HGCA)
OSR Researchers
OSR Breeders
Agronomists
Farmers

The Defra WGIN: Dissemination, Liaison and Communication

Annual “Stakeholders’ Forum” (Nov)

“Cereal Genetics and Genomics Workshop”
(Dec 2003) → BBSRC funded annual Small Grain cereals workshop

“ Traits Workshops ” (June 2004)

Workshops with overseas partner organisations : CIMMYT, INRA etc.

Web Site (www.WIGN.org.UK)

Six Monthly Electronic Newsletter

The Defra OREGIN: Dissemination, Liaison and Communication

Annual “Stakeholders’ Forum” (March)

Annual workshops in conjunction with the UK
Brassica Research Community (July)

Workshops with overseas partner organisations:
INRA, University of Melbourne, etc.

Web Site (www.OREGIN.info)

Regular emails via the UK BRC distribution list

Representation at HGCA

workshops/Cereals/growers events

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